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PROGRESS REPORT

BADGER WASH COOPERATIVE STUDY
PRECIPITATION, RUNOFF, AND SEDIMENT YIELD, 1970 SEASON

by

Gregg C. Lusby, Research Hydrologist

WATERSHED COVER AND FORAGE UTILIZATION 1970-1971

by

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Progress Report

Badger Wash Cooperative Study

Precipitation, Runoff, and Sediment Yield, 1970 Season

by Gregg C. Lusby

Shown in the following tables are data on precipitation, runoff, and sediment yield obtained at the Badger Wash study area during 1970.

Precipitation amounts are shown in table 1. Average precipitation for the summer season, April 8 to October 29, as measured in 12 rain gages was 4.73 inches, which is .28 inch less than the average for the previous 16 years. The rain during one storm was unevenly distributed and produced runoff in the northeast part of the basin but not elsewhere.

Runoff and sediment yield from all watersheds is shown in table 2 and runoff from paired watersheds by storms is shown in table 3.

Table 1.--Precipitation, Badger Wash (April 8 to October 29, 1970)

[When numbers are shown in parentheses, no daily record obtained. Amounts estimated from total catch or other records.]

Date		Amount (inches)												Watershed number							
		Gage number																			
		1	2	3	3A	4	5	6	7	7A	8	9	11	1A	1B	2A	2B	3A	3B	4A	4B
Apr.	11	0.09	0.12	0.07	0.07	0.10	0.11	0.18	0.10	0.12	0.10	0.12	0.10	0.09	0.10	0.08	0.07	0.11	0.13	0.12	0.11
	17	.41	.43	.40	.43	.40	.42	.44	.37	.43	.40	.40	.40	.41	.42	.42	.43	.42	.43	.42	.42
	18	.18	.17	.16	.15	.10	(.15)	.16	.20	.12	.10	.13	.10	.18	.18	.13	.15	.15	.15	.12	.11
	21	.19	.17	.16	.15	.10	(.14)	.16	.13	.11	.20	.14	.20	.19	.18	.13	.15	.14	.15	.14	.15
	22	.02	.02	.04	.03	.10	(.03)	.03	.03	.03	.10	.04	(.03)	.02	.02	.05	.03	.03	.03	.05	.06
	27	.10	.10	.14	.14	.10	(.14)	.10	.09	.10	.10	.12	(.08)	.10	.10	.13	.14	.14	.13	.10	.10
June	5	.02	.01	0	.02	0	.01	.01	0	0	0	0	0	.02	.02	.01	.02	.01	.01	0	0
	7	.02	.04	.02	.03	(.03)	.03	.04	.02	.04	(.04)	.03	(.03)	.02	.03	.03	.03	.03	.03	.04	.04
	8	.04	.07	.05	.04	.10	.08	.09	.06	.08	.10	.05	.10	.04	.05	.06	.04	.08	.08	.08	.09
	9	.18	.20	.15	.19	.20	.19	.22	.14	.16	.10	.15	(.10)	.18	.19	.19	.19	.19	.20	.14	.14
	10	.32	.33	.40	.37	.40	.39	.39	.39	.43	.60	.44	(.60)	.32	.32	.38	.37	.39	.39	.47	.50
	11	.05	.05	.03	.07	.10	.07	.07	.05	.05	.10	.06	(.10)	.05	.05	.08	.07	.07	.07	.06	.07
July	6	.28	.30	.26	.24	.30	.29	.31	.32	.36	.30	.40	.40	.28	.29	.26	.24	.29	.30	.35	.34
	7	.01	0	(.01)	.01	(.01)	.02	0	(.01)	.01	(.01)	0	0	.01	.01	.01	.01	.02	.01	.01	.01
	17	.04	.06	0	0	0	.10	.06	0	0	0	0	0	.04	.05	0	0	.10	.09	0	0
	18	.05	.07	0	0	0	(.05)	.06	0	0	0	0	0	.05	.06	0	0	.05	.05	0	0
	21	.10	.12	.03	0	0	(.08)	.11	0	.02	(.02)	.02	(.01)	.10	.11	0	0	.08	.09	.02	.02
	22	.07	.08	.07	0	0	(.04)	.05	0	.02	(.02)	.02	(.02)	.07	.07	0	0	.04	.04	.02	.02
	25	.04	.06	.08	.07	0	(.05)	.05	(.02)	.01	(.01)	.01	(.04)	.04	.05	.05	.07	.05	.05	.01	.01
	26	.02	.02	.06	.04	.10	(.02)	.02	.03	.04	(.04)	.09	(.05)	.02	.02	.06	.04	.02	.02	.05	.04
Aug.	2	0	0	0	0	0	(.03)	.04	(.01)	.01	(.02)	.02	0	0	0	0	0	.03	.03	.01	.01
	20	.18	.45	.11	.20	.10	(.65)	(.50)	.55	.61	.40	.39	(.20)	.18	.32	.17	.20	.65	.61	.52	.52
	21	.41	.48	.40	.41	.50	(.53)	(.46)	.48	.48	.50	.45	(.50)	.41	.44	.44	.41	.53	.51	.48	.49
	31	.04	.05	(.01)	.01	(.02)	(.06)	.09	.02	.04	(.02)	0	(.03)	.04	.04	.01	.01	.06	.07	.03	.03
Sept.	1	.02	.01	(.02)	.02	(.01)	(.01)	.01	(.01)	.01	(.01)	0	0	.02	.02	.02	.02	.01	.01	.01	.01
	4	.04	.05	.04	.06	(.05)	.05	.04	.04	.05	(.03)	0	0	.04	.04	.06	.06	.05	.05	.04	.04
	5	.50	.50	.43	.51	.50	.47	.48	.38	.40	.50	.40	.50	.50	.50	.51	.51	.47	.47	.42	.44
	12	.02	.02	.01	.02	(.02)	.01	.01	(.01)	.01	0	0	0	.02	.02	.02	.02	.01	.01	.01	.01
	13	.13	.15	.12	.15	.20	.12	.15	.15	.18	.10	.18	.20	.13	.14	.17	.15	.12	.13	.16	.15

Date

Oct. 6
7
9
10
22
24
25
26

Total

Apr 8-Oct.29,

Nov.6, 1969-

Oct. 29, 19

Table 1.--Precipitation, Badger Wash (April 8 to October 29, 1970)

[When numbers are shown in parentheses, no daily record obtained. Amounts estimated from total catch or other records.]

Date		Amount (inches)																			
		Gage number												Watershed number							
		1	2	3	3A	4	5	6	7	7A	8	9	11	1A	1B	2A	2B	3A	3B	4A	4B
Oct.	6	.10	.10	.17	.18	.20	.12	.19	.17	.23	.20	.15	.10	.10	.10	.19	.18	.12	.14	.21	.22
	7	.04	.05	.04	.05	(.05)	.05	.05	.03	.05	(.05)	.04	.10	.04	.04	.05	.05	.05	.05	.05	.05
	9	.08	.10	.05	.07	.10	.08	.10	.07	.08	.10	.04	(.05)	.08	.09	.08	.07	.08	.09	.08	.09
	10	.14	.14	.19	.14	.20	.13	.13	.13	.11	.20	.19	.20	.14	.14	.16	.14	.13	.13	.14	.15
	22	.21	.25	.21	.25	.20	.20	.21	.20	.24	.20	.17	.20	.21	.23	.23	.25	.20	.20	.22	.22
	24	.18	(.21)	.20	.21	.20	.19	.21	.19	.20	.20	.16	.20	.18	.19	.21	.21	.19	.20	.19	.20
	25	.03	(.03)	.03	.02	.10	.04	.03	.02	.02	.10	.02	(.02)	.03	.03	.05	.02	.04	.04	.04	.05
	26	.07	(.05)	.04	.07	(.05)	.06	.05	.02	.04	(.03)	.03	.05	.07	.06	.06	.07	.06	.06	.04	.04
Total																					
Apr 8-Oct.29,1970		4.42	5.06	4.20	4.44	4.64	5.21	5.30	4.44	4.89	5.00	4.46	4.71	4.42	4.72	4.50	4.42	5.21	5.25	4.85	4.95
Nov.6, 1969-		7.83	8.59	7.43	--	--	8.53	9.12	7.34	--	--	7.70	--	--	--	--	--	--	--	--	--
Oct. 29, 1970																					

Table 2.--Runoff at Badger Wash, 1970

Drainage basin	Drainage area (sq mi)	Runoff		Sediment	
		Acre-ft	Acre-ft per sq mile	Acre-ft	Acre-ft per sq mile
1A	0.066	0.034	0.52	T	0
1B	.084	0	0	0	0
2A	.148 ^{1/}	0	0	0	0
2B	.158	0	0	0	0
3A	.059	1.058	17.93	.137	2.322
3B	.048	.898	18.71	.051	1.062
4A	.022	.098	4.45	.025	1.136
4B	.019	0	0	0	0
5	.055	0	0	0	0
6	.220	1.273	5.79	T	0
7	.094	0	0	0	0
8	.109	0	0	0	0
9	.313	.299	.96	T	0
10	.100	.102	1.02	T	0
11	.089	1.030	11.57	.062	.697
12	.092	1.523	16.55	.043	.467
13	.484	0	0	0	0
14	1.53	5.485	3.58	T	0
15	.136	.154	1.13	T	0
16	.239	.004	.02	T	0

^{1/} Excluding runoff from auxiliary watershed.

T Amount too small to measure.

Table 3.--Runoff, Badger Wash
Observation Reservoir 1A

Location.--Lat 39°20', long 108°56', in sec. 24, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area.--0.066 sq mi (42 acres).

Records available.--April 1954 to November 1970, summer months only.

Gage.--Water-stage recorder. Elevation of gage 5,058.08 ft above mean
sea level.

Runoff and discharge determination.--Contents of reservoir and volume
of inflow computed from a stage-capacity curve of the reservoir.

Maxima.--Maximum storm inflow 3.27 acre-ft, 49.5 acre-ft per sq mile,
July 25, 1955.

Remarks.--Records good.

Capacities.--At spillway level (gage-ht of 54.7 ft):

December 1953	- 8.10 acre ft
July 1955, November 1956	- 7.39 acre-ft
October 1957, November 1958	- 7.15 acre-ft
November 1959	- 6.86 acre-ft
November 1961	- 6.50 acre-ft
November 1962	- 6.42 acre-ft
November 1963	- 6.37 acre-ft
November 1964	- 6.33 acre-ft
November 1965	- 5.88 acre-ft
November 1966	- 5.88 acre-ft
November 1967	- 5.72 acre-ft
November 1968	- 5.20 acre-ft
November 1969	- 5.26 acre-ft
November 1970	- 5.26 acre-ft

Watershed 1A, Storm runoff, April 8 to October 29, 1970

Date	Precipitation (inches)	Inflow		
		Acre-ft	Acre-ft per sq mile	Inches
Sept. 5	0.50	0.022	0.33	0.006
13	.13	.002	.03	.001
Oct. 10	.14	.010	.15	.003
Total	--	.034	.51	.010

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 1B

Location.--Lat 39°20', long 108°56', in sec. 25, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area.--0.084 sq mi (54 acres).

Records available.--April 1954 to November 1970 summer months only.

Gage.--Water-stage recorder. Elevation of gage is 5,023.92 ft above
mean sea level.

Runoff and discharge determinations.--Contents of reservoir and volume
of inflow computed from a stage-capacity curve of the reservoir.

Maxima.--Maximum storm inflow volume 3.46 acre-ft, 41.2 acre-ft per
sq mile, July 26, 1968.

Remarks.--Records good.

Capacities.--At spillway level (gage-ht of 19.5 ft):

December 1953	- 19.8 acre-ft
July 1955, November 1956	- 19.2 acre-ft
October 1957, November 1958, November 1959	- 19.1 acre-ft
November 1961	- 18.7 acre-ft
November 1962	- 18.6 acre-ft
November 1963	- 18.5 acre-ft
November 1964	- 18.5 acre-ft
November 1965	- 18.2 acre-ft
November 1966	- 18.2 acre-ft
November 1967	- 18.0 acre-ft
November 1968	- 17.4 acre-ft
November 1969	- 17.4 acre-ft
November 1970	- 17.4 acre-ft

Watershed 1B, storm runoff, April 8 to October 29, 1970

No runoff.

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 2A

Location--Lat 39°20', long 108°57', in sec. 36, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area--0.148 sq mi (95 acres).

Records available--April 1954 to November 1970, summer months only.

Gage--Water-stage recorder. Elevation of gage is 4,946.43 ft above
mean sea level. Reservoir of side drainage in same watershed
equipped with reference mark, crest stages noted. Elevation of
reference mark is 4,940 ft (from topographic map).

Runoff and discharge determinations--Contents of reservoirs and volume
of inflow computed from a stage capacity curve of the reservoir.

Maxima--Maximum storm inflow volume 7.71 acre-ft, 46.2 acre-ft per
sq mile, July 25, 1955. Inflow lasted 50 minutes.

Remarks--Records good.

Capacities--At spillway level.

<u>Main reservoir</u>	<u>Auxiliary reservoir</u>
Dec. 1953 - 6.34 acre-ft	Dec. 1953 - 6.14 acre-ft
July 1955, Nov. 1956 - 4.42 acre-ft	July 1955, Nov. 1956, Oct. 1957,
Oct. 1957, Nov. 1958 - 3.93 acre-ft	Nov. 1958 - 5.71 acre-ft
Nov. 1959 - 3.72 acre-ft	Nov. 1959 - 5.61 acre-ft
Dam raised Nov. 1959	July 1962 - 5.55 acre-ft
Nov. 1959 - 15.08 acre-ft	Nov. 1963 - 5.49 acre-ft
Nov. 1961 - 13.86 acre-ft	Nov. 1964 - 5.31 acre-ft
Nov. 1962 - 13.70 acre-ft	Nov. 1965 - 5.18 acre-ft
Nov. 1963 - 13.53 acre-ft	Nov. 1966 - 5.18 acre-ft
Nov. 1964 - 12.40 acre-ft	Nov. 1967 - 5.24 acre-ft
Nov. 1965 - 12.07 acre-ft	Nov. 1968 - 4.98 acre-ft
Nov. 1966 - 12.07 acre-ft	Nov. 1969 - 5.00 acre-ft
Nov. 1967 - 11.49 acre-ft	Nov. 1970 - 5.00 acre-ft
Nov. 1968 - 10.52 acre-ft	
Nov. 1969 - 10.60 acre-ft	
Nov. 1970 - 10.60 acre-ft	

Table on next page.

Watershed 2A, Storm runoff, April 8 to October 29, 1970

No runoff.

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 2B

Location--Lat 39°20', long 108°57', in sec. 25, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area--0.158 sq mi (101 acres).

Records available--April 1954 to November 1970, summer months only.

Gage--Water-stage recorder. Elevation of gage is 4,970 ft above mean
sea level.

Runoff and discharge determinations--Contents of reservoir and volume
of inflow computed from a stage capacity curve of the reservoir.

Maxima--Maximum storm inflow volume 6.29 acre-ft, 39.8 acre-ft per
sq mile, July 25, 1955. Inflow lasted 90 minutes.

Remarks--Records good.

Capacities--At spillway level.

December 1953	- 8.45 acre-ft
July 1955, November 1956, October 1957, November 1958	- 6.05 acre-ft
Dam raised	
June 1959	- 24.8 acre-ft
November 1959	- 24.5 acre-ft
November 1961	- 23.8 acre-ft
November 1962	- 23.6 acre-ft
November 1963	- 23.5 acre-ft
November 1964	- 23.0 acre-ft
November 1965	- 22.7 acre-ft
November 1966	- 22.7 acre-ft
November 1967	- 22.3 acre-ft
November 1968	- 21.3 acre-ft
November 1969	- 21.5 acre-ft
November 1970	- 21.5 acre-ft

Table on next page.

Watershed 2B, Storm runoff, April 8 to October 29, 1970

No runoff.

Reference to Report made April 8 to October 19 1970

No report

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 3A

Location--Lat 39°20', long 108°56', in sec. 25, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area--0.059 sq mi (38 acres).

Records available--April 1954 to November 1970, summer months only.

Gage--Water-stage recorder. Elevation of gage 5,033.68 ft above
mean sea level.

Runoff and discharge computations--Contents of reservoir and volume
of inflow computed from a stage capacity curve of the reservoir.

Maxima--Maximum storm inflow volume 2.98 acre-ft, 50.5 acre-ft per
sq mile, July 25, 1955.

Remarks--Records good.

Capacities--At spillway level.

December 1956	- 12.90 acre-ft
July 1955, November 1956	- 12.63 acre-ft
October 1957, November 1958	- 12.53 acre-ft
November 1959	- 12.32 acre-ft
November 1961	- 12.12 acre-ft
November 1962	- 12.03 acre-ft
November 1963	- 12.00 acre-ft
November 1964	- 11.97 acre-ft
November 1965	- 11.53 acre-ft
November 1966	- 11.53 acre-ft
November 1967	- 11.33 acre-ft
November 1968	- 10.86 acre-ft
November 1969	- 10.84 acre-ft
November 1970	- 10.70 acre-ft

Table on next page.

Table 1. -- Summary, Boulder Wash, Colorado
Operation Reservoir 3A

Location -- Lat. 39°30', Long. 108°30', in sec. 22, T. 8 S., R. 104 W.,
near Rocky Mountain Co., Colo.

Drainage area -- 0.039 sq. mi. (2.5 acres).

Records available -- April 1955 to November 1959, summer months only.

Gage -- Water-stage recorder. Elevation of gage 5,077.45 ft above
mean sea level.

Spill and discharge capacity -- Discharge of reservoir and volume
of inflow computed from a stage capacity curve of the reservoir.

Rating -- Maximum storm rating volume 1.98 acre-ft, 30.7 acre-ft per
ft above, July 22, 1957.

Remarks -- Reservoir good.

Operation -- At spillway level.

November 1959	- 12.90 acre-ft
July 1955, November 1955	- 12.81 acre-ft
October 1957, November 1958	- 14.35 acre-ft
November 1959	- 12.92 acre-ft
November 1961	- 12.92 acre-ft
November 1962	- 12.92 acre-ft
November 1963	- 12.92 acre-ft
November 1964	- 12.92 acre-ft
November 1965	- 12.92 acre-ft
November 1966	- 12.92 acre-ft
November 1967	- 12.92 acre-ft
November 1968	- 12.92 acre-ft
November 1969	- 12.92 acre-ft
November 1970	- 12.92 acre-ft

Date	Precipitation (inches)	Acre-ft	Inflow	
			Acre-ft per sq mile	Inches
Aug. 20	0.65	0.444	7.53	0.140
21	.53	.176	2.98	.056
Sept. 5	.47	.309	5.24	.098
13	.12	.066	1.12	.021
Oct. 10	.13	.063	1.07	.020
Total	--	1.058	17.94	.335

Date	Prescription (Inches)	Acres	Total	
			per acre	per acre
Aug. 20	0.85	0.44	1.22	0.44
21	2.2	1.1	2.2	0.75
Sept. 2	2.2	1.1	2.2	0.75
13	1.1	0.55	1.1	0.55
Oct. 10	1.1	0.55	1.1	0.55
Total	-	1.68	17.4	3.5

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 3B

Location.--Lat 39°20', long 108°56', in sec. 25, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area.--0.048 sq mi (31 acres).

Records available.--April 1954 to November 1970, summer months only.

Gage.--Water-stage recorder. Elevation of gage is 5,013.80 ft above
mean sea level.

Runoff and discharge determinations.--Contents of reservoir and volume
of inflow computed from a stage capacity curve of the reservoir.

Maxima.--Maximum storm runoff volume 2.35 acre-ft, 49.6 acre-ft per
sq mile, July 25, 1955.

Remarks.--Records good.

Capacities.--At spillway level.

December 1953	- 8.10 acre-ft
July 1955, November 1956	- 7.69 acre-ft
October 1957, November 1958	- 7.65 acre-ft
November 1959	- 7.52 acre-ft
November 1961	- 7.38 acre-ft
November 1962	- 7.16 acre-ft
November 1963	- 6.99 acre-ft
November 1964	- 6.97 acre-ft
November 1965	- 6.74 acre-ft
November 1966	- 6.74 acre-ft
November 1967	- 6.47 acre-ft
November 1968	- 6.00 acre-ft
November 1969	- 6.11 acre-ft
November 1970	- 6.06 acre-ft

Table on next page.

Watershed 3B, Storm runoff; April 8 to October 29, 1970

Date	Precipitation (inches)	Acre-ft	Inflow	
			Acre-ft per sq mile	Inches
Aug. 20	0.61	0.094	1.96	0.036
21	.51	.371	7.73	.144
Sept. 5	.47	.319	6.65	.123
13	.13	.062	1.29	.024
Oct. 6	.14	.016	.33	.006
10	.13	.036	.75	.014
Total	--	.898	18.71	.347

Stationed at. Station number. April 5 to October 30, 1970

Date	Precipitation (inches)	Runoff inches	Station	
			Runoff inches	Station
Aug. 20	0.61	0.004	1.96	0.036
21	.31	.071	1.73	.144
Sept. 2	.63	.219	6.93	.113
11	.17	.081	1.39	.029
8	.12	.016	.32	.000
10	.11	.036	.33	.014
Total	--	.609	12.71	.341

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 4A

Location--Lat 39°19', long 108°56', sec. 36, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area--0.022 sq mi (14 acres).

Records available--April 1954 to November 1970, summer months only.

Gage--Water-stage recorder. Elevation of reference mark is 4,944.83
ft above mean sea level.

Runoff and discharge determinations--Contents of reservoir and volume
of inflow computed from a stage-capacity curve of the reservoir.

Maxima--Maximum storm inflow volume, 1.20 acre-ft, 54.5 acre-ft per
sq mi, July 25, 1955. Inflow lasted 45 minutes.

Remarks--Records good.

Capacities--At spillway level.

December 1953	- 3.05 acre-ft
July 1955, November 1956	- 2.60 acre-ft
October 1957, November 1958	- 2.39 acre-ft
November 1959	- 2.33 acre-ft
November 1961, November 1962	- 2.10 acre-ft
November 1963	- 2.05 acre-ft
November 1964	- 1.90 acre-ft
November 1965	- 1.72 acre-ft
November 1966	- 1.72 acre-ft
November 1967	- 1.61 acre-ft
November 1968	- 1.47 acre-ft
November 1969	- 1.47 acre-ft
Reservoir cleaned June 1970	
June 1970	- 2.54 acre-ft
November 1970	- 2.52 acre-ft

Table on next page.

Table 1. - Summary of Water-Content Data
for the Lake Mead Reservoir

Location - Lake Mead, Nev., 36° 15' N., 115° 15' W.,
 near Mead, Nev., U.S.A.

Geologic Age - Tertiary (see notes).

Period Available - April 1944 to November 1970, annual figures only.

Data - Water-level recorded. Elevation of lake surface only in 1944-45.
 It shows mean sea level.

Notes - Water-level - Elevation of lake surface only in 1944-45.
 of water recorded from a series of gauging stations.

Notes - Water-level - Elevation of lake surface only in 1944-45.
 of water recorded from a series of gauging stations.

Remarks - Records good.

Statistics - At spring level.

November 1970 - 2.55 acre-ft

July 1970, November 1970 - 2.55 acre-ft

October 1969, November 1969 - 2.55 acre-ft

November 1968 - 2.55 acre-ft

November 1967, November 1967 - 2.55 acre-ft

November 1966 - 2.55 acre-ft

November 1965 - 2.55 acre-ft

November 1964 - 2.55 acre-ft

November 1963 - 2.55 acre-ft

November 1962 - 2.55 acre-ft

November 1961 - 2.55 acre-ft

November 1960 - 2.55 acre-ft

November 1959 - 2.55 acre-ft

November 1958 - 2.55 acre-ft

November 1957 - 2.55 acre-ft

November 1956 - 2.55 acre-ft

November 1955 - 2.55 acre-ft

November 1954 - 2.55 acre-ft

November 1953 - 2.55 acre-ft

November 1952 - 2.55 acre-ft

November 1951 - 2.55 acre-ft

November 1950 - 2.55 acre-ft

November 1949 - 2.55 acre-ft

November 1948 - 2.55 acre-ft

November 1947 - 2.55 acre-ft

November 1946 - 2.55 acre-ft

November 1945 - 2.55 acre-ft

November 1944 - 2.55 acre-ft

November 1943 - 2.55 acre-ft

November 1942 - 2.55 acre-ft

November 1941 - 2.55 acre-ft

November 1940 - 2.55 acre-ft

November 1939 - 2.55 acre-ft

November 1938 - 2.55 acre-ft

November 1937 - 2.55 acre-ft

November 1936 - 2.55 acre-ft

November 1935 - 2.55 acre-ft

Table on next page.

Watershed 4A, Storm runoff, April 8 to October 29, 1970

Date	Precipitation (inches)	Inflow		
		Acre-ft	Acre-ft per sq mile	Inches
Aug. 20	0.52	0.028	1.27	0.024
21	.48	.017	.77	.015
Sept. 5	.42	.023	1.05	.020
13	.16	.001	.05	.001
Oct. 6	.21	.022	1.00	.019
10	.14	.007	.32	.006
Total	--	.098	4.46	.085

WATERBURY, CT. Electric Company, April 5 to October 15, 1920

Date	Gross Meter Reading (kwhrs)	Initial Meter Reading	
		Net Meter Reading	Index
Apr. 5	0.12	0.000	0.000
Apr. 11	4.4	0.010	0.010
Apr. 12	3.2	0.003	0.003
Apr. 13	1.0	0.001	0.001
Oct. 8	1.1	0.003	0.003
Oct. 10	1.2	0.004	0.004
Total		0.023	0.023
		0.00	0.00

Table 3.--Runoff, Badger Wash--Continued
Observation Reservoir 4B

Location--Lat 39°19', long 108°56', in sec. 36, T. 8 S., R. 104 W.,
near Mack, Mesa Co., Colo.

Drainage area--0.019 sq mi (12 acres).

Records available--April 1954 to November 1970, summer months only.

Gage--Water-stage recorder. Elevation of reference mark is 4,969.96
ft above mean sea level.

Runoff and discharge determinations--Contents of reservoir and volume
of inflow computed from a stage-capacity curve of the reservoir.

Maxima--Maximum inflow 48.0 cfs, 5:45 pm, July 25, 1955. Maximum
storm inflow volume 0.77 acre-ft, 40.5 acre-ft per sq mi, July 25,
1955

Remarks--Records good.

Capacities--At spillway level.

December 1953	- 4.52 acre-ft
July 1955, November 1956	- 4.24 acre-ft
October 1957, November 1958	- 4.16 acre-ft
November 1959, November 1961	- 4.11 acre-ft
November 1962	- 4.09 acre-ft
November 1963	- 4.05 acre-ft
November 1964	- 3.98 acre-ft
November 1965	- 3.85 acre-ft
November 1966	- 3.85 acre-ft
November 1967	- 3.77 acre-ft
November 1968	- 3.70 acre-ft
November 1969	- 3.78 acre-ft
November 1970	- 3.78 acre-ft

Table on next page.

Watershed 4B, Storm runoff, April 8 to October 29, 1970

No runoff.

Badger Wash Progress Report 1970-1971

Watershed Cover and Forage Utilization

by J. Robert Owen

Watershed Cover--Fall 1970

Watershed cover was sampled on the eight experimental watersheds in September 1970 using the all-contacts point quadrat method. This method is described in the 1969-1970 progress report. The watershed cover data for 1970 are summarized in Table 1.

For purposes of watershed cover and floristic composition comparisons in this progress report, 1967 has been selected as the base year. Prior to 1967 West Twin (2A) and Prairie Dog (4A) watersheds were grazed by cattle and sheep during the winter-spring period, since then, however, these two watersheds have been excluded from grazing. Upper Hanks (1A) and Oilwell (3A) watersheds also changed in 1967 from cattle and sheep use to sheep use only during the winter. These two treatments will hereinafter be referred to as formerly grazed and grazed treatments, respectively. The remaining four watersheds which have been excluded from grazing since 1953 will continue to be called ungrazed.

Since 1967, the formerly grazed watershed 2A is the only one to show a significant decrease in hits on bare soil. Mulch increased on both of the formerly grazed 2A and 4A watersheds and on the ungrazed 4B watershed. Hits on live vegetation were higher on all watersheds in 1970, however, the increases were not significant on the grazed watersheds (1A and 3A) or the formerly grazed 2A watershed.

This upward trend is to be expected because precipitation for the period October 31, 1966 to October 31, 1970 was above average for Badger Wash.

Badger Wash Progress Report 1970-1971
Watershed Cover and Forage Utilization
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Watershed Cover-Fall 1970

Watershed cover was sampled on the eight experimental watersheds in September 1970 using the all-compass point quadrat method. This method is described in the 1969-1970 progress report. The watershed cover data for 1970 are summarized in Table I.

For purposes of watershed cover and floristic composition comparisons in this progress report, 1967 has been selected as the base year. Prior to 1967 West Twin (2A) and Prairie Dog (4A) watersheds were grazed by cattle and sheep during the winter-spring period, since then, however, these two watersheds have been excluded from grazing. Upper Banks (1A) and Olive Hill (3A) watersheds also changed in 1967 from cattle and sheep use to sheep use only during the winter. These two treatments will hereinafter be referred to as formerly grazed and grazed treatments, respectively. The remaining four watersheds which have been excluded from grazing since 1967 will continue to be called ungrazed.

Since 1967, the formerly grazed watershed 2A is the only one to show a significant decrease in litter on bare soil. Litter increased on both of the formerly grazed 1A and 4A watersheds and on the ungrazed 5A watershed. Litter on live vegetation was higher on all watersheds in 1970, however, the increases were not significant on the grazed watersheds (1A and 3A) or the formerly grazed 2A watershed.

This upward trend is to be expected because precipitation for the period October 31, 1966 to October 31, 1970 was above average for Badger Wash.

A more refined look at the changes in cover since 1967 can be obtained by stratifying the data with respect to vegetal type and grazing treatment. In the 1969-1970 progress report the shadscale-galleta grass and the nuttall saltbush types were defined as the main vegetal types at Badger Wash. This distinction was made on the basis of the similar vegetal composition and soil characteristics within the two types.

Since 1967, there has been no significant change in bare soil, rock, mulch, or live vegetation on either the grazed shadscale type or the grazed nuttall saltbush type. In 1970 the formerly grazed shadscale type had a significant reduction in bare soil and a significant increase in mulch. The formerly grazed nuttall saltbush type had significant increases in both live vegetation and mulch. The ungrazed shadscale type had a significant decrease in bare soil and significant increase in mulch and live vegetation. Live vegetation increased significantly on the ungrazed nuttall saltbush type. These data are summarized in Table 2.

There have been some changes in the floristic composition of the two vegetal types with respect to treatment since 1967. These data are summarized in Table 3. The column entitled abundance is the sum of the hits per 100 pins divided by the number of transects on which the species occurs. It is related to the number of individuals along the transect, the crown spread, and the crown volume of the individual species, although these catagories are not distinguished. The column entitled frequency is the percentage of transects on which the individual species occur. It is used as an estimate of the spatial distribution of a species within the community. The column entitled hits per 100 pins is the product of abundance times frequency. It is the proportion of hits per 100 pins that a single species contributes to the total vegetation within the type.

A more refined look at the changes in cover since 1957 can be obtained by stratifying the data with respect to vegetative type and grazing treatment. In the 1959-1970 progress report the shrubland-*Yucca* grass and the mesquite-sagebrush types were defined as the main vegetative types at Badger Wash. This distinction was made on the basis of the standing vegetative composition and soil characteristics within the two types.

Since 1957, there has been no significant change in bare soil, rock, mesquite, or live vegetation on either the grazed shrubland type or the grazed mesquite-sagebrush type. In 1970 the formerly grazed shrubland type had a significant reduction in bare soil and a significant increase in mesquite. The formerly grazed mesquite-sagebrush type had significant increases in both live vegetation and mesquite. The ungrazed shrubland type had a significant decrease in bare soil and significant increases in mesquite and live vegetation. Live vegetation increased significantly on the ungrazed mesquite-sagebrush type. These data are summarized in Table 1.

There have been some changes in the floristic composition of the two vegetative types with respect to treatment since 1957. These data are summarized in Table 2. The column entitled Abundance is the sum of the hits per 100 pins divided by the number of transects on which the species occurs. It is related to the number of individuals along the transect, the crown spread, and the crown volume of the individual species, although these categories are not distinguished. The column entitled Frequency is the percentage of transects on which the individual species occur. It is used as an estimate of the spatial distribution of a species within the community. The column entitled hits per 100 pins is the product of abundance times frequency. It is the proportion of hits per 100 pins that a single species contributes to the total vegetation within the type.

The abundance and frequency columns are shown because a species can exhibit high abundance and low frequency or low abundance and high frequency and still contribute the same quantity of vegetation to the type. Both types of information are useful for determining the response of vegetation to the three treatments.

No statistical comparisons have been made of the data in Table 3, but since 1967 some changes in the individual species are evident. Indian ricegrass, bottlebrush squirreltail, and cheatgrass were greater in both abundance and frequency within the shadscale type on all three treatments in 1970. This is most likely due to the good moisture conditions that have prevailed since 1967. The abundance and frequency of salina wildrye was considerably greater in the ungrazed shadscale type in 1970, and some improvement was also noted in the grazed shadscale type. Galleta grass decreased in either frequency or abundance on all three treatments in the shadscale type. Old growth of galleta grass in the formerly grazed treatment accounted for a considerable amount of mulch in this treatment-type. Greene's rabbitbrush increased in abundance in the grazed and ungrazed shadscale type, but showed a slightly lower frequency in the grazed type (probably not significant). Shadscale was unchanged in the grazed treatment but its abundance increased slightly in the formerly grazed and ungrazed treatments.

Some slight changes were also apparent within the nuttall saltbush type. Indian ricegrass was more abundant and more frequent in all three treatments. Salina wildrye increased in abundance in all three treatments and increased slightly in frequency in the formerly grazed and ungrazed treatments. Nuttall saltbush increased in abundance in the formerly grazed and ungrazed treatments.

The abundance and frequency columns are shown because a species can exhibit high abundance and low frequency or low abundance and high frequency and still contribute the same quantity of vegetation to the type. Both types of information are useful for determining the response of vegetation to the three treatments.

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Green's rabbitbrush increased in abundance in the grazed and ungrazed shadscale type, but showed a slightly lower frequency in the grazed type (probably not significant). Shadscale was unchanged in the grazed treatment but its abundance increased slightly in the formerly grazed and ungrazed treatments.

Some slight changes were also apparent within the nuttall rabbitbrush type. Indian ricegrass was more abundant and more frequent in all three treatments. Saline wildtype increased in abundance in all three treatments and increased slightly in frequency in the formerly grazed and ungrazed treatments. Nuttall rabbitbrush increased in abundance in the formerly grazed and ungrazed treatments.

Greene's rabbitbrush increased in abundance in all three treatments, but decreased slightly in frequency in the grazed treatment.

Changes that might be due to the effects of grazing or non-grazing since 1967 may be illustrated by comparing differences in the sum of hits per 100 pins (abundance x frequency) of the important forage species on the six treatment types (Table 4). The species included in these data are salina wildrye, galleta grass, Indian ricegrass, shadscale, nuttall saltbush, big sagebrush, and Greene's rabbitbrush. In the grazed treatment the combined hits per 100 pins of these species has not changed since 1967 in either the shadscale or the nuttall saltbush types. Hits per 100 pins increased in all of the remaining treatment-types except the formerly grazed shadscale type. This decrease was due to a decline in hits on galleta grass which is the most prominent species of this treatment type. Galleta grass decreased in the other treatment types also, but the declines were not as great.

Forage Utilization

The study watersheds were grazed for a 5-day period in early January 1971 by 1,800 sheep. This stocking rate is somewhat less than the previous two winters. The forage utilization data are summarized in Table 5. Grazing continues to be heavier on Upper Hanks than Oilwell watershed. Surprisingly, use on salina wildrye was much less than in previous years on both watersheds.

Snow covered the watersheds during the grazing period. Some snow was still present while the utilization estimates were being made. Consequently, the trampling effect was not as apparent this year.

Greene's rabbitbrush increased in abundance in all three treatments, but

decreased slightly in frequency in the grazed treatment.

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1967 may be illustrated by comparing differences in the sum of hits per 100

pins (abundance x frequency) of the important forage species on the six

treatment types (Table 4). The species included in these data are saline

wildrye, galletta grass, Indian ricegrass, shadscale, nuttall saltbrush, pig

sagebrush, and Greene's rabbitbrush. In the grazed treatment the combined

hits per 100 pins of these species has not changed since 1967 in either the

shadscale or the nuttall saltbrush types. Hits per 100 pins increased in all

of the remaining treatment-types except the formerly grazed shadscale type.

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the grazing effect was not as apparent this year.

Table 1.--Watershed cover summary, All-Contacts Method

September 1970

Watershed	Hits/100 pins			
	Bare soil	Rock	Mulch	Live vegetation
Upper Hanks (1A)	59	13	29	32
Lower Hanks (1B)	58	13	27	34
West Twin (2A)	57	10	27	33
Yucca (2B)	47	18	36	30
Oilwell (3A)	70	12	20	24
North Basin (3B)	76	5	18	27
Prairie Dog (4A)	56	30	13	26
Windy Point (4B)	57	27	16	25

Table 1.--Watershed cover summary. All-Contacts Method

September 1970

Watershed	Htcs/100 plus			live vegetation
	Base roll	Rock	Mulch	
Upper Hanke (1A)	39	13	29	32
Lower Hanke (1B)	38	13	27	34
West Twin (2A)	27	10	27	33
Yucca (2B)	47	18	26	30
Olwell (3A)	70	12	50	34
North Hanke (3B)	70	2	18	37
Prairie Dog (4A)	26	30	13	26
Windy Point (4B)	27	27	16	22

Table 2.--Watershed cover by plant type and grazing treatment--fall measurements--1967 and 1970

Plant type and treatment	Year	Hits/100 pins			
		Bare soil	Rock	Mulch	Live vegetation
Shadscale-galletta grass type					
Grazed (34)*	1967	61	13	28	30
	1970	62	12	32	31
Formerly grazed (20)	1967	62	13	30	35
	1970	52	11	51	35
Ungrazed (40)	1967	52	18	34	25
	1970	45	19	46	34
Nuttall saltbush type					
Grazed (14)	1967	72	11	17	23
	1970	72	13	18	21
Formerly grazed (28)	1967	63	25	13	16
	1970	60	26	18	25
Ungrazed (56)	1967	69	16	17	18
	1970	70	13	21	26

* Numbers in parentheses indicate the number of transects in each type.

Table 2--Waterbed cover by plant type and grazing

Treatment--fall measurements--1967 and 1970

Plant type and treatment	Year	Hils/100 pine			
		Bare soil	Rock	Mulch	Live vegetation
<i>Shadocia-gallia</i>					
Grazed type					
Grazed (34)*	1967	61	13	28	30
	1970	63	13	32	31
Formerly grazed (30) 1967	1967	62	13	30	32
	1970	52	11	31	32
Ungrazed (40)	1967	52	18	34	22
	1970	42	19	40	34
<i>Notall salishua</i> type					
Grazed (14)	1967	52	11	17	23
	1970	52	13	18	21
Formerly grazed (28) 1967	1967	63	22	13	16
	1970	60	26	18	22
Ungrazed (26)	1967	69	16	17	18
	1970	70	13	21	20

* Numbers in parentheses indicate the number of transects in each type.

Table 3A.--Badger Wash floristic composition

Fall 1967

Species	Shadscale Type								
	Grazed (34)*			Formerly grazed (20)			Ungrazed (40)		
	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins
Grasses									
<u>Elymus salinus</u>	2.33	14.7	.34	0	0	0	7.12	35.0	2.49
<u>Hilaria jamesii</u>	12.15	82.4	10.01	18.77	100.0	18.77	11.51	60.0	6.91
<u>Oryzopsis hymenoides</u>	1.58	23.5	.37	.66	10.0	.07	1.60	12.5	.20
<u>Sitanion hystrix</u>	1.00	11.7	.12	1.05	35.0	.37	1.44	30.0	.43
<u>Bromus tectorum</u>	1.96	55.8	1.09	6.33	40.0	2.53	1.91	27.5	.53
Other grasses	--	--	0	--	--	0	--	--	.03
Shrubs									
<u>Artemisia spinescens</u>	1.50	5.8	.09	0	0	0	.75	10.0	.08
<u>Artemisia tridentata</u>	3.00	29.4	.88	3.67	5.0	.18	10.17	20.0	2.03
<u>Atriplex confertifolia</u>	7.00	100.0	7.00	3.88	95.0	3.69	5.33	97.5	5.20
<u>Atriplex corrugata</u>	0	0	0	0	0	0	0	0	0
<u>Atriplex nuttallii</u>	3.83	11.7	.45	.33	5.0	.02	3.00	2.5	.08
<u>Chrysothamnus greenii</u>	1.77	47.0	.83	1.00	5.0	.05	4.27	50.0	2.14
<u>Gutierrezia sarothrae</u>	2.91	64.7	1.88	1.81	35.0	.63	2.43	45.0	1.09
<u>Tetradymia spinosa</u>	2.83	17.6	.50	5.33	15.0	.80	3.11	7.5	.23
Other shrubs	--	--	.34	--	--	.07	--	--	.09
Forbs									
<u>Aster venustus</u>	.66	3.0	.02	.33	5.0	.02	.83	5.0	.04
<u>Bahia nudicaulis</u>	.85	26.4	.22	.33	5.0	.02	.55	7.5	.04
<u>Malcolmia africana</u>	3.85	38.2	1.47	5.56	60.0	3.34	2.00	22.5	.45
<u>Salsola kali</u>	4.46	38.2	1.70	6.00	25.0	1.50	.33	2.5	T
<u>Sphaeralcea coccinea</u>	.64	38.2	.24	1.23	50.0	.54	1.21	27.5	.33
Other forbs	--	--	2.31	--	--	2.20	--	--	2.15

*Numbers in parentheses denote number of transects.

Table 3B.--Badger Wash floristic composition

Fall 1967

Species	Nuttall Saltbush Type								
	Grazed (34)			Formerly grazed (20)			Ungrazed (40)		
	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins
Grasses									
<u>Elymus salinus</u>	5.44	21.4	1.16	4.70	39.2	1.84	7.60	28.5	2.17
<u>Hilaria jamesii</u>	6.33	21.4	1.35	5.06	42.8	2.17	6.14	39.2	2.41
<u>Oryzopsis hymenoides</u>	0	0	0	1.67	39.2	.65	3.02	26.7	.81
<u>Sitanion hystrix</u>	1.00	5.0	.05	0	0	0	0	0	0
<u>Bromus tectorum</u>	0	0	0	0	0	0	0	0	0
Other grasses	--	--	0	--	--	.03	--	--	0
Shrubs									
<u>Artemisia spinescens</u>	0	0	0	4.44	10.7	.48	1.53	17.8	.27
<u>Artemisia tridentata</u>	0	0	0	0	0	0	2.60	8.9	.23
<u>Atriplex confertifolia</u>	4.88	21.4	1.04	2.50	14.2	.36	3.03	17.8	.54
<u>Atriplex corrugata</u>	9.11	21.4	1.95	1.33	3.5	.05	2.78	5.3	.15
<u>Atriplex nuttallii</u>	8.23	92.8	7.64	6.02	96.4	5.80	5.12	91.0	4.66
<u>Chrysothamnus greenii</u>	3.77	64.2	2.42	1.82	53.5	.97	3.81	64.2	2.45
<u>Gutierrezia sarothrae</u>	2.41	28.5	.69	1.26	50.0	.63	1.98	32.1	.64
<u>Tetradymia spinosa</u>	12.33	21.4	2.64	2.44	10.7	.26	1.78	26.7	.48
Other shrubs	--	--	.27	--	--	.13	--	--	.12
Forbs									
<u>Aster venustus</u>	1.72	42.8	.74	.66	28.5	.19	1.46	33.9	.49
<u>Bahia nudicaulis</u>	0	0	0	1.00	3.5	.04	.33	1.7	T
<u>Malcolmia africana</u>	0	0	0	1.35	71.4	.96	.67	5.3	.04
<u>Salsola kali</u>	0	0	0	.99	7.0	.07	0	0	0
<u>Sphaeralcea coccinea</u>	0	0	0	.33	3.5	T	0	0	0
Other forbs	--	--	2.88	--	--	1.60			2.21

Table 3C.--Badger Wash floristic composition

Fall 1970

Species	Shadscale Type								
	Grazed (34)			Formerly grazed (20)			Ungrazed (40)		
	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins
Grasses									
<u>Elymus salinus</u>	3.61	17.6	.64	0	0	0	10.13	45.0	4.56
<u>Hilaria jamesii</u>	12.46	67.6	8.42	15.03	100.00	15.03	8.60	65.0	5.59
<u>Oryzopsis hymenoides</u>	3.67	35.2	1.29	1.56	30.0	.47	3.72	30.0	1.12
<u>Sitanion hystrix</u>	1.39	32.3	.45	2.25	40.0	.90	2.33	52.5	1.22
<u>Bromus tectorum</u>	5.93	73.5	4.36	13.40	70.0	9.38	11.62	37.5	4.36
Other grasses	--	--	--	--	--	.05	--	--	.22
Shrubs									
<u>Artemisia spinescens</u>	3.00	2.9	.09	0	0	0	2.58	10.0	.26
<u>Artemisia tridentata</u>	4.58	23.5	1.08	12.67	5.0	.63	10.93	22.5	2.46
<u>Atriplex confertifolia</u>	6.92	100.0	6.92	4.75	80.0	3.80	6.75	97.5	6.58
<u>Atriplex corrugata</u>	0	0	0	0	0	0	0	0	0
<u>Atriplex nuttallii</u>	2.00	5.8	.12	.33	5.0	T	0	0	0
<u>Chrysothamnus greenii</u>	3.29	41.1	1.35	1.00	5.0	.05	8.05	50.0	4.02
<u>Gutierrezia sarothrae</u>	3.04	47.0	1.43	1.44	30.0	.43	1.64	35.0	.57
<u>Tetradymia spinosa</u>	3.00	8.8	.26	.67	5.0	.03	5.33	7.5	.40
Other shrubs	--	--	.31	--	--	.28	--	--	.12
Forbs									
<u>Aster arenosus</u>	1.64	38.2	.63	1.67	10.0	.17	3.05	17.5	.53
<u>Aster venustus</u>	0	0	0	1.5	10.0	.15	1.00	10.0	.10
<u>Bahia nudicaulis</u>	1.40	29.4	.42	4.33	5.0	.22	1.40	12.5	.18
<u>Malcolmia africana</u>	2.05	20.5	.42	2.00	25.0	.50	.66	10.0	.07
<u>Phlox longifolia</u>	.47	14.7	.07	1.17	20.0	.23	.77	25.0	.19
<u>Salsola kali</u>	.33	2.9	T	0	0	0	0	0	0
<u>Sphaeralcea coccinea</u>	.71	47.0	.33	.56	55.0	.31	.92	30.0	.28
Other forbs	--	--	2.43	--	--	2.07	--	--	1.52

Table 3D.--Badger Wash floristic composition

Fall 1970

Species	Nuttall Saltbush Type								
	Grazed (14)			Formerly grazed (28)			Ungrazed (56)		
	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins	Abun- dance	Fre- quency	Hits/ 100 pins
Grasses									
<u>Elymus salinus</u>	7.56	21.4	1.62	7.72	42.8	3.30	9.87	32.1	3.17
<u>Hilaria jamesii</u>	5.11	21.4	1.09	6.70	39.2	2.63	5.56	41.0	2.28
<u>Oryzopsis hymenoides</u>	.75	28.5	0.21	4.52	57.1	2.58	4.83	42.8	2.07
<u>Sitanion hystrix</u>	0	0	0	0	0	0	.87	7.1	.06
<u>Bromus tectorum</u>	0	0	0	0	0	0	.66	1.7	.01
Other grasses	--	--	--	--	--	--	--	--	--
Shrubs									
<u>Artemisia spinescens</u>	0	0	0	1.33	3.5	.05	2.23	17.8	.40
<u>Artemisia tridentata</u>	.33	7.1	.02	0	0	0	3.83	7.6	.29
<u>Atriplex confertifolia</u>	4.17	28.5	1.19	3.39	21.4	.73	3.20	17.8	.57
<u>Atriplex corrugata</u>	7.50	28.5	2.13	.67	3.5	.02	.67	7.1	.05
<u>Atriplex nuttallii</u>	7.85	92.8	7.28	8.72	96.4	8.41	8.14	87.5	7.12
<u>Chrysothamnus greenii</u>	4.42	57.1	2.52	4.17	64.2	2.68	7.21	60.7	4.38
<u>Gutierrezia sarothrae</u>	2.75	57.1	1.57	1.82	53.5	.97	1.35	30.3	.41
<u>Tetradymia spinosa</u>	2.67	21.4	.57	3.42	14.2	.49	3.31	25.0	.83
Other shrubs	--	--	.62	--	--	.39	--	--	.08
Forbs									
<u>Aster arenosus</u>	0	0	0	0	0	0	.66	2.3	T
<u>Aster venustus</u>	1.15	64.2	.74	1.92	42.8	.82	1.85	51.7	.96
<u>Bahia nudicaulis</u>	0	0	0	.67	3.5	.02	.66	3.5	.02
<u>Malcolmia africana</u>	1.00	7.1	.07	.72	21.4	.15	.33	2.4	T
<u>Phlox longifolia</u>	3.00	7.1	.21	.42	14.2	.06	1.24	37.5	.46
<u>Salsola kali</u>	0	0	0	0	0	0	0	0	0
<u>Sphaeralcea coccinea</u>	.66	7.1	.05	2.00	3.5	.07	.83	3.5	.03
Other forbs	--	--	1.08	--	--	1.99	--	--	2.53

Table 2D--Bedrock Wash Chloride Composition

Fall 1978

Species	Nutrient Salts Type					
	Grass			Formerly Graded		
	Abund-	Pre-	HTA/	Abund-	Pre-	HTA/
	100 gms	100 gms	100 gms	100 gms	100 gms	100 gms
Grasses						
<i>Elymus setifolius</i>	7.56	21.4	1.63	7.52	43.8	3.30
<i>Heteropogon jamesii</i>	2.11	21.4	1.08	6.70	30.2	3.63
<i>Cynopogon bispinosus</i>	1.72	18.2	0.21	4.52	37.1	2.58
<i>Cynodon dactylon</i>	0	0	0	0	0	0
<i>Briza media</i>	0	0	0	0	0	0
Other grasses	--	--	--	--	--	--
Shrubs						
<i>Artemisia tridentata</i>	0	0	0	1.33	3.2	1.02
<i>Artemisia tridentata</i>	1.33	7.1	1.02	0	0	0
<i>Artemisia tridentata</i>	4.12	18.2	1.19	3.32	11.4	1.73
<i>Artemisia tridentata</i>	7.56	18.2	2.13	6.7	3.2	1.02
<i>Artemisia tridentata</i>	7.82	21.8	7.28	8.72	26.4	8.61
<i>Cercocarpus betulifolia</i>	4.42	27.1	2.32	4.12	64.2	2.68
<i>Cercocarpus betulifolia</i>	2.72	27.1	1.27	1.82	33.2	1.97
<i>Tetradlea spines</i>	2.62	11.4	1.27	3.62	14.2	1.49
Other shrubs	--	--	--	--	--	1.39
Forbs						
<i>Aster strigosus</i>	0	0	0	0	0	0
<i>Aster strigosus</i>	1.12	14.2	1.74	1.92	41.8	1.82
<i>Aster strigosus</i>	0	0	0	6.7	3.2	1.02
<i>Aster strigosus</i>	1.00	7.1	1.02	7.2	21.4	1.73
<i>Phlox paniculata</i>	1.00	7.1	1.02	4.2	14.2	1.00
<i>Salvia miltiorrhiza</i>	0	0	0	0	0	0
<i>Salvia miltiorrhiza</i>	1.00	7.1	1.02	1.00	3.2	1.02
Other forbs	--	--	1.08	--	--	1.99

Table 4.--Changes in combined hits per 100 pins

important forage species

Fall 1967 to Fall 1970

Frequency of
occurrence

Upper Basin Oilwell
1A 3A

Plant type	Year	Grazed	Formerly grazed	Ungrazed	1A	3A
Shadscale type					16.6	16.6
					31.3	30.0
	1967	20	23	19	41.6	16.6
	1970	20	20	24	34.1	4.1
Nuttall saltbush type					30.0	30.0
					33.3	25.0
	1967	14	12	13	30.0	8.3
	1970	14	20	20	41.6	12.5
					4.1	4.1
					4.1	4.1
					10	37.5
					4.1	4.1
					4.1	4.1
					45.8	4.1
					100.0	70.8
					12.5	12.5
					42.5	42.5
					34.1	70.8
					4.1	4.1
					4.1	4.1
					4.1	4.1
					34.1	34.1
					37.5	4.1
					16.6	30.0

Table 4.--Changes in combined life per 100 pins

Important forage species

Fall 1967 to Fall 1970

Plant type	Year	Grazed	Formerly grazed	Ungrazed
Shadecanopy type				
	1967	20	23	19
	1970	20	20	24
Hottel's salicoid type				
	1967	14	12	13
	1970	14	20	20

Table 5.--Badger Wash utilization--January 1971

Type	Percent use		Frequency of occurrence	
	Upper Hanks 1A	Oilwell 3A	Upper Hanks 1A	Oilwell 3A
Grasses				
<u>Elymus salinus</u>	9	15	33.3	16.6
<u>Hilaria jamesii</u>	12	10	79.1	58.3
<u>Oryzopsis hymenoides</u>	5	4	33.3	50.0
<u>Sitanion hystrix</u>	4	5	41.6	16.6
<u>Sporobolus cryptandrus</u>	24	--	16.6	--
Forbs				
<u>Aster areuosus</u>	T	0	54.1	4.1
<u>Aster venustus</u>	--	6	--	50.0
<u>Astragalus asclep.</u>	0	0	4.1	12.5
<u>Astragalus confertiflorus</u>	2	T	33.3	25.0
<u>Bahia nudicaulis</u>	3	0	50.0	8.3
<u>Erigeron Spp.</u>	6	4	41.6	37.5
<u>Eriogonum bicolor</u>	--	6	--	12.5
<u>Eriogonum microthecum</u>		0		4.1
<u>Eriogonum ovalifolium</u>	0	0	4.1	4.1
<u>Phlox longifolia</u>	0	0	4.1	4.1
<u>Sphaeralcea coccinea</u>	5	10	12.5	20.8
<u>Stanleya pinnata</u>	5	--	4.1	--
Shrubs				
<u>Artemisia spinescens</u>	0	35	4.1	8.3
<u>Artemisia tridentata</u>	40	25	45.8	8.3
<u>Atriplex confertifolia</u>	7	12	100.0	70.8
<u>Atriplex corrugata</u>	--	3	--	12.5
<u>Atriplex nuttallii</u>	--	7	--	62.5
<u>Chrysothamnus greenii</u>	38	19	54.1	70.8
<u>Chrysothamnus nauseosus</u>	--	0	--	4.1
<u>Ephedra sp.</u>	--	40	--	4.1
<u>Eurotia lanata</u>	10	--	8.3	--
<u>Gutierrezia sarothrae</u>	0	0	54.1	54.1
<u>Opuntia sp.</u>	0	0	37.5	4.1
<u>Tetradymia spinosa</u>	0	0	16.6	50.0



